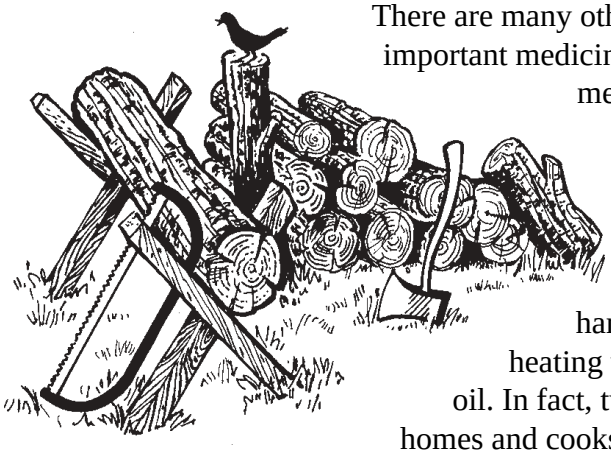
UNIT 4
PEOPLE AND THE FOREST

Forest Benefits

Products

How much is a tree or a forest worth? There are many answers, depending on whom you ask. The value of lumber products or what can be made out of the wood usually is the first value placed on a tree. The sale of trees and logs in Iowa totals $14 million annually.

Wood products are all around us–lumber, furniture, toothpicks, baseball bats, sleds, axe handles, newspapers, books, insulation for houses, cellophane, carpeting, adhesives, rayon, ceramics, medicines, deodorant, vanilla flavoring, and colognes.



There are many other useful forest products. Forest plants produce important medicines. They also are genetic storehouses for other medicinal ingredients waiting to be discovered. Specialized food products (e.g., maple syrup, nuts, berries, mushrooms) are harvested from forests. The fur industry harvests forest animals to manufacture clothing. Many people use wood to heat their homes. One **cord** of a hardwood (a stack 4 ft. x 4 ft. x 8 ft.) has the heating value of one ton of coal or 200 gallons of fuel oil. In fact, two-thirds of the world's population heats their homes and cooks their food with wood or charcoal.

Many local economies depend on forest resources. Forests provide a variety of employment opportunities, from growing, cutting, preparing, transporting, and selling wood products to medical research. Iowa's 300 wood-using businesses employ more than 7,000 people and generate $1 billion annually in economic value throughout the state. Approximately 300 Iowa Christmas tree growers sell over 50,000 trees each year, earning more than $600,000. Forests are renewable resources. When well managed, they can sustain the production of these products and the employment of many people for a very long time.

Recreation

More people are discovering the enjoyment of hiking, biking, camping, and just spending time outdoors. Different forest management plans are needed to accommodate the wide array of uses. Some recreational activities depend on developing a natural area, such as trails for hiking and biking or camping facilities. Hunting, fishing, and bird watching can be enjoyed in undeveloped forests.

> *"Recreational development is a job not of building roads into lovely country, but of building receptivity into the … human mind."*
>
> Aldo Leopold
> A Sand County Almanac

The amount of public land available for outdoor recreation in Iowa is limited. The supply/use of available recreation areas is monitored by IDNR to help guide acquisition and development decisions. It is essential to determine Iowa's recreational needs to reduce overcrowding on public lands, protect natural resources, and make the best use of limited staff and funds. A majority of Iowa's public recreation areas are forested parks; protecting them for future recreational use and public enjoyment is a high priority.

Some Iowa cities use their native spring flowers and fall foliage to attract visitors. The annual *Forest Crafts Festival* at Lacey-Keosauqua attracts 10-12,000 visitors each year. Tourists viewing fall leaf color in northeast Iowa generate an estimated $5.9 million for local communities annually.

In 1999, 14.7 million people visited Iowa's 84 state parks, forests, and recreation areas. Almost 770,000 Iowans and more than 61,000 non-residents purchased hunting and fishing licenses. License fees and the expense of supplies and lodging generated more than $1.1 billion to Iowa's economy.

Water Quality

Soil Erosion

Forests help protect water quality. Forest cover intercepts rain before it reaches the ground. Forested soils (with their leafy organic matter/soils) have high infiltration rates that absorb rain and snow melt and slowly release it to nearby streams and lakes. Roots of forest plants create pores in the soil for water to flow through, increasing its water-holding capacity by up to five times that of cropped or grazed agricultural land. Trees, shrubs, and other forest plants transpire several thousand gallons of water per acre every day. Reducing the amount of surface water runoff and slowing it down prevents soil erosion.

Silt (fine soil particles) is the main pollutant in Iowa waters. Iowa has lost half its topsoil in the last hundred years. The annual cost of removing sediments from ditches, lakes, water supplies, and agricultural drainage systems is estimated at 32 million dollars. About half of Iowa's forests are on slopes greater than 10 percent; the other half is in floodplains. These forests offer tremendous opportunities to protect and enhance water quality.

Streambank erosion is a serious problem in Iowa. Farmland is lost, bridges are washed away, and roads are closed. Straightened (channelized) creeks and streams send water downstream faster and faster, eroding more and more soil. Re-establishing riparian vegetation, native grasses, shrubs, and trees along and next to eroding streambanks holds soil in place.

Chemical Pollution

Some tree species take up and store large amounts of nutrients and chemicals. Pesticides (herbicides and insecticides) can adhere to soil particles or dissolve in surface water. Trees, grasses, and forests strategically planted and maintained between agricultural fields and streams act as buffers, trapping soil and absorbing excess nutrients (from fertilizers) and pesticides. This helps keep these chemicals out of our waters.

Air Quality

Forest plants produce oxygen we need to breathe. In addition, forests improve air quality. Tree leaves filter the air, removing some pollutants.

The most common air pollutant in Iowa is particulates. **Particulate pollution** may be caused by dust from gravel roads, agricultural practices, construction sites, and many types of manufacturing. If particles are small enough they can cause eye and throat irritation, bronchitis, lung damage, and impaired visibility.

Most chemical pollutants in Iowa's air come from the burning of fossil fuels in vehicles and power plants. These pollutants contribute to acid rain and the greenhouse effect. Forests are **carbon sinks** (absorb and hold carbon dioxide from the atmosphere). Carbon dioxide is the main contributor to the greenhouse effect, leading to potential global warming. Carbon absorption by forests helps reduce the effects of some fossil fuel emissions.

Properly designed and maintained **shelterbelts** around farmsteads conserve energy, reducing the amount of fossil fuel needed. A well-designed shelterbelt can reduce winter home heating bills by as much as 30 percent.

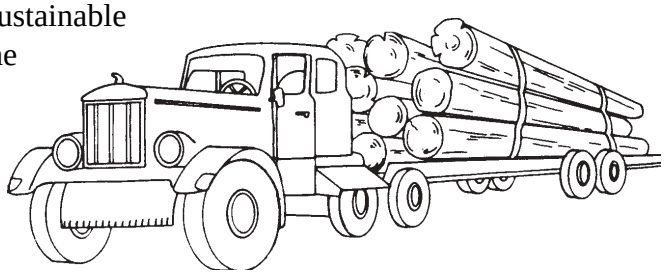
Deciduous trees placed on the south and west sides of urban or rural homes shade them in the summer, reducing the need for air conditioning by 40 to 50 percent. These trees allow the sun to warm the house in the colder fall and winter months. As an added bonus, shelterbelts and yard landscaping increase property values up to 15 percent.

Aesthetics

Forests provide immeasurable benefits in their aesthetics or beauty. The beauty of Iowa's landscape has been documented in books, films, poems, and personal diaries for years. Iowa is home to sweeping countryside, radiant autumn color, velvety-covered riversides, peaceful wildlife sanctuaries, and expansive vistas. The *Great River Road* (along the Mississippi River in eastern Iowa) and the *Loess Hills Scenic Byway* (along the Missouri River valley in western Iowa) provide access to some of Iowa's most scenic vistas. These roads provide numerous overlooks and panoramic views for tourists.

Sustainable Use

Sustainable use is when a resource is used without reducing its long-term availability or limiting its ability to renew itself. When properly harvested, a forest can replace what was removed, making the forest a **renewable** or sustainable resource. However, overuse and abuse can alter the forest environment significantly. In this case, the forest may not be able to renew itself or it may take several generations to be replaced. Unwise or short-term selective logging practices can make forest resources fundamentally **nonrenewable**.



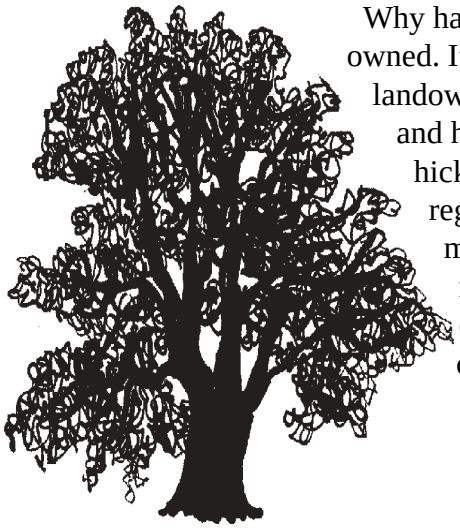
Management Plans

One of the first considerations when deciding how to manage a forest is the intended use of the forest. Most Iowa forests can sustain multiple uses. Timber harvesting may be compatible with creating and maintaining certain types of wildlife habitat, recreational opportunities, air and water quality, and aesthetics. However, a forest managed for timber harvest would not be useful for maple syrup production, as the same trees are needed for each activity. Hunting and hiking, at times, may be incompatible. Planning is necessary to avoid conflicts. Mutually exclusive activities can be accommodated if the forest is large enough to be divided into areas for each.

A professional forester evaluates the quality of a forest by conducting an inventory of the forest resources after landowner management goals and objectives have been determined. Samples or plots of the forest are measured for **regeneration** (number of smaller trees available to renew the forest after harvest) and **merchantability** (number of harvestable trees and amount of wood volume they could produce). The species of trees and their sizes are recorded. Both tree height and **diameter at breast height** (**DBH**–diameter 4.5 feet above the ground) are measured. The numbers of trees in different size classes are recorded. Damage to trees from insects, weather, fire, etc. is recorded.

Foresters also gather other information about the forest. This includes history of the area (e.g., Has it been harvested in the past? Has it been grazed by livestock?), the general topography of the area, the forest type (deciduous, conifer, mixed), and the makeup of the shrub and herbaceous layers. Soil types and drainages should be noted. Animal (including human) activities in the area also may be analyzed.

Tree measurements help determine if timber harvesting can be done economically. **Veneer logs** are very high quality and used to make fine pieces of furniture. **Sawlogs** are used for lumber. **Pulpwood** is used mainly by the paper products industry. **Fuel wood** or firewood can come in any size. The forester provides this information to the forest owner, who decides what to do with their forests.



Why harvest a forest? In Iowa, 92 percent of forested land is privately owned. If a forest can be harvested on a sustained yield basis, the landowner will benefit financially and can keep the forest productive and healthy. Almost half of Iowa forests are comprised of oaks and hickories. Most oaks are only semi-shade tolerant and do not regenerate well in a mature forest. As they mature the understory is made up of more shade tolerant hickories, ironwood, and sugar maples. Harvesting can be used to maintain a major oak component in these forests. Harvesting creates openings in the canopy and provides more sunlight for new oaks to grow.

Much preparation is needed before a timber harvest (e.g., plant and animal inventories, economical feasibility assessment). A landowner should always consult with an objective professional forester to protect their land and investment. It is especially important where there are significant natural communities. For example, most state forests or old growth forests have wonderful woodland flower communities, some with endangered or threatened species. Without an inventory, these plants could be destroyed in an unplanned harvest. A specific management approach is needed to meet landowner goals and conserve rare species.

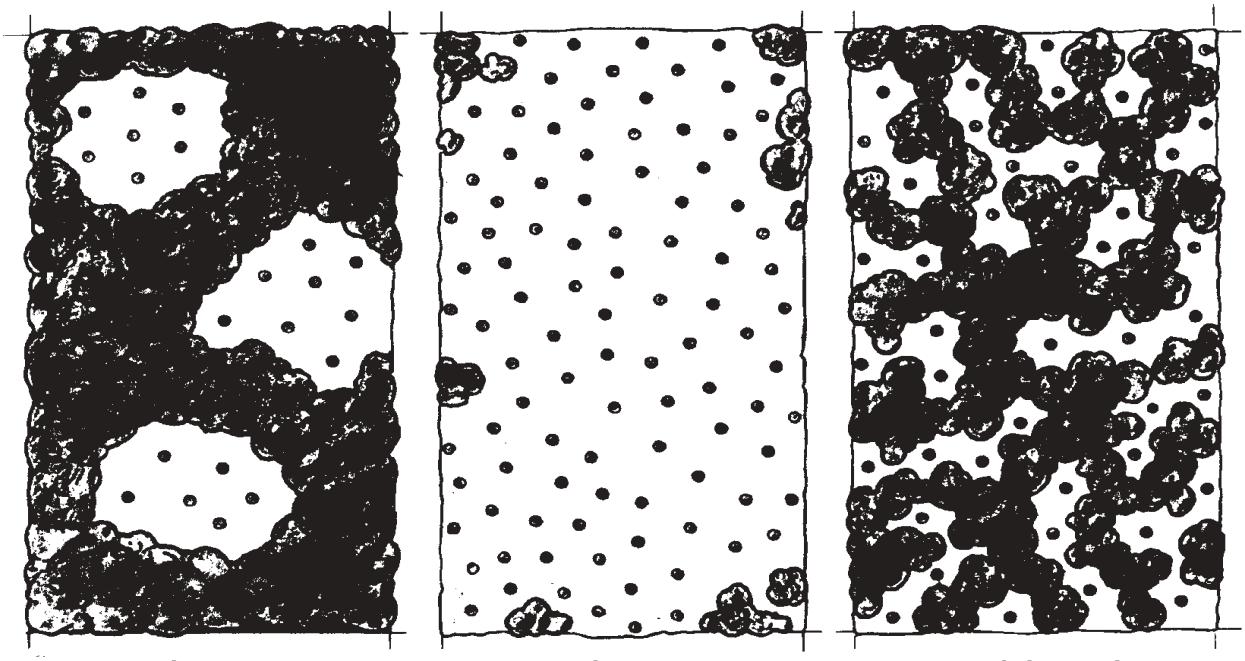
Harvesting Methods

Clearcutting is one method of forest harvest. Clearcutting removes all the trees in an area. This method is used when the desired species to be re-established are shade intolerant (e.g., pines, oaks).

The regeneration potential for the site is established before trees are harvested. For example, at least 500 oak seedlings per acre, three to four feet tall, should be present in the understory before harvest. If the desired number of seedlings is not present, oak seedlings can be planted one to two years before, or immediately after, harvest.

Another technique to encourage oak regeneration after a clearcut is to time the harvest with a large acorn crop. Trees are harvested just after acorns have dropped. Large equipment is used to expose soil, making a seedbed for the acorns.

The **selection method** of harvest is designed to maintain a forest of mixed ages and sizes of trees. Individual trees or groups of trees are selected for harvest. Trees selected for harvest should be from all size classes and in varying conditions. Small openings created by the harvest improve the growing conditions for remaining trees. In a few years new trees are established and others are ready to harvest. This method is best suited to the regeneration of trees that are partially shade tolerant.



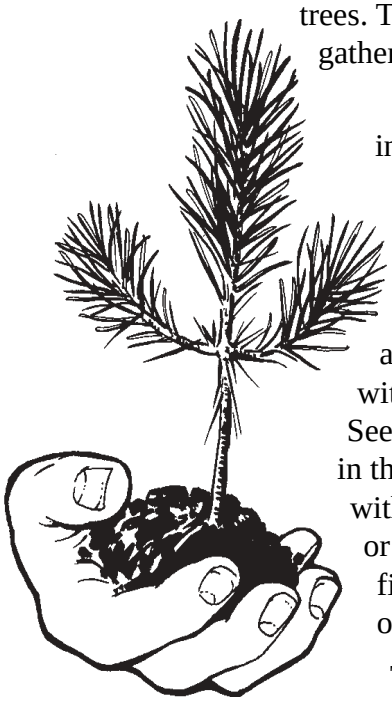
selection *clearcut* *shelterwood*

Unlike the selection method, **selective cutting** or **highgrading** takes the biggest and best trees from the forest, degrading future forest trees.

The **shelterwood method** is a series of harvests done over several years. The understory is harvested the first year. This understory harvest can be timed with a good acorn crop to improve oak regeneration. Some overstory trees are removed to stimulate development of new seedlings. The best trees are left standing as shelter and as a seed source. The remaining overstory is harvested once the regenerated seedlings have been established successfully.

Forest Establishment

There are two ways to establish a forest in an area that presently does not have trees. Trees can be directly seeded or planted as seedlings. Seeds can be gathered by hand from high quality trees.



Many seeds must be planted to get even a few to germinate and grow into trees. A rate of approximately 1,000 acorns per acre is recommended for oak seedings. Losses due to insects, predation, and infection are very high. It is estimated that only one percent of seeds live to become trees.

Another way to establish a forest is to grow the seeds in a nursery and then plant one to two year old seedlings. Seedlings can be planted with a tree planter pulled behind a tractor or planted by hand with a spade. Seedlings are planted at the rate of 500 to 1,200 per acre. Other vegetation in the area must be controlled to allow the seedlings to get established without too much competition. Vegetation control can be done by mowing or through the proper use of herbicides. Seedlings need this help for two to five years, until they are large enough to have the competitive edge over other species that may be present.

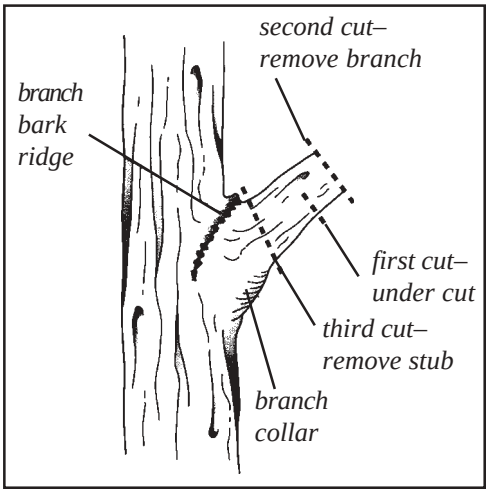
The IDNRs' State Forest Nurseries in Ames and Montrose and privately owned tree nurseries supply bare root trees for reforestation efforts. Packages of seedlings also are available for shelterbelt plantings and for backyard habitat enhancements.

A forest can grow by itself. However, some **timber stand improvement** (**TSI**) methods may be needed to manage a forest for a specific goal. The goal may be to enhance the wildlife habitat in the forest, profit from harvesting quality sawlog trees, or both! TSI usually involves cutting down some trees and leaving others to take advantage of the increased sun, nutrients, and water.

Noncommercial thinning is cutting down trees, shrubs, or other vegetation hindering growth of desirable trees. Cut trees can be used as fuel wood or left to add nutrients to the forest soil.

Commercial thinning usually is done where trees are of similar ages and sizes. Trees are removed to prevent overcrowding. Cut trees have market value as fuel wood or pulpwood. This type of thinning can be done every five to 10 years. A properly thinned stand should have 180 to 250 trees per acre.

Identifying **crop trees** is another TSI method. About 150 trees per acre are selected based on their species, form, and health. These are the crop trees. Crop trees should be spaced approximately 20 feet apart. Trees that may interfere with the crop trees' growth are removed. The most valuable species in Iowa are black walnut and red and white oaks. Trees also may be selected as crop trees for their value to wildlife–trees with cavities or ones that will produce large **mast** (nut) crops.



Pruning is an intensive TSI method. It is used only for trees that will produce valuable sawlogs. Lower branches, which can form knots in the wood and make it less valuable, are removed.

TSI is hard work and requires much patience, but can improve the forest for sustained yield of wood products and for wildlife habitat. Both state and private foresters are available in Iowa to help landowners manage their woodlands.

Protection

Public Ownership

IDNR, county conservation boards, and private non-profit natural resource agencies own forested areas in Iowa. These are managed for many outdoor recreational activities. There are four major state forests in Iowa–Loess Hills State Forest in Harrison and Monona counties in western Iowa; Yellow River State Forest in Allamakee county; Shimek State Forest in Lee and Van Buren counties; and Stephens State Forest in Clarke, Davis, Jasper, Monroe, and Lucas counties. A total of 41,816 acres are in state forests.

State forests are managed to be sustainable and provide recreational opportunities. Shimek State Forest (9,148 acres) is the largest contiguous stand of forest cover in the state. Stephens State Forest (13,300 acres) has camping areas, horseback riding trails, and excellent deer and turkey hunting opportunities. Yellow River State Forest (8,503 acres) has hiking trails developed for a variety of users. These areas were chosen for purchase because of their uniqueness, quality, and completeness of the forest system.

Private Lands Management

Grazing Damage

Over half of Iowa's private forests are used for pasture or grazing. Research shows that forest grazing is not productive for livestock or forests. Cattle that graze in forested areas do not gain weight quickly because of low forage quality. Soils in grazed forests have less organic matter because livestock remove understory vegetation. They become compacted and do not hold runoff water. Soil may become so damaged that it cannot support quality pasture plants.

Uncontrolled grazing can reduce diversity of forest plants and eliminate natural tree reproduction. Lower limbs of larger trees can be damaged, creating a grazing line in heavily used forests. As trees die in a heavily grazed forest, they are not replaced.

Timber Reserve

The **timber reserve law** has been in effect in Iowa since 1919. This law gives landowners an incentive to protect and manage their forested areas.

Qualifying forested areas on private land are property tax exempt. The forest area must be at least two acres in size with at least 200 growing trees per acre. No grazing is allowed. Trees may be harvested, so long as not more than one-fifth (20 percent) are removed in any year. The landowner must replant trees to maintain 200 trees per acre. Applications for timber reserve tax exemption are available from county auditors.

Cost-Share

Many **cost-share** programs are available to landowners to establish forested areas or to better manage their forest acres. Most are initiated with federal or state funds. They pay 50 to 75 percent of costs associated with tree planting, TSI, and other management practices. See the *Resource Guide* for a listing of programs and their descriptions.

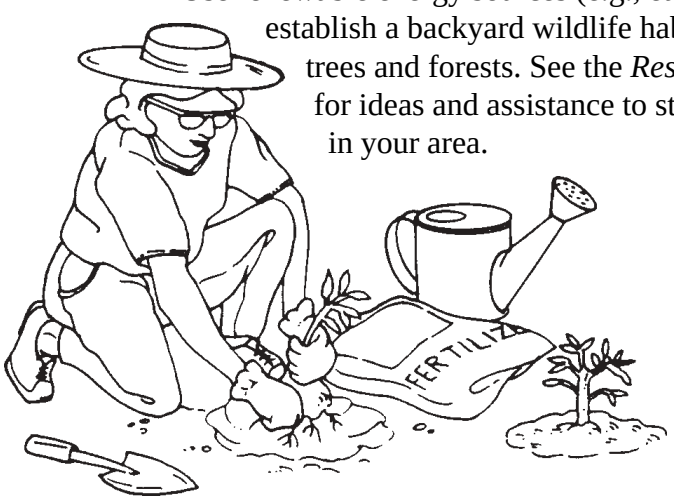
Forestry Assistance

IDNR employs professional foresters who provide technical forestry advice and guidance to Iowa's private forest owners. Assistance includes establishing landowner objectives for the area, reviewing the status of forests and/or prairies through mapping and inventory, and developing long-term stewardship plans. Foresters help landowners achieve their objectives through tree planting, timber stand improvement, wildlife habitat enhancement, timber harvesting, and regeneration efforts.

IDNR foresters manage 42,000 acres of state forests in Iowa. State forest nurseries produce more than five million native conservation trees and shrubs for reforestation on public and private lands. Some foresters help protect forests from insects, disease, wildfire, and natural disasters. Others help industries utilize wood products efficiently, in a sustainable way. Urban foresters help replant and manage our street, park, and yard trees.

Everyone Can Help Forests

Everyone can help protect Iowa's forests. Celebrate *Earth Day* and *Arbor Day* every day. Recycle and use recycled products to make efficient use of our resources. Use renewable energy sources (e.g., ethanol). Plant trees in your community or establish a backyard wildlife habitat to help others learn about the importance of trees and forests. See the *Resource Guide* for lists of agencies and programs for ideas and assistance to start projects to enhance Iowa's forest resources in your area.



Careers

A career in natural resources is another way to help the forest resource. Professional foresters depend on knowledge from various fields of study to be successful at their jobs. Most foresters have at least a bachelor's degree in forestry. This four-year degree involves the study of ecology, forest economics, resources management, dendrology (tree identification), forest policy, biology, physics, social sciences, and more. Much of a forester's work requires not only knowledge of trees and forest systems, but also excellent communication skills in dealing with the public.

A forestry education can lead to many different careers. Most foresters work for government agencies. The federal government utilizes foresters in the Forest Service, Bureau of Land Management, National Park Service, Natural Resources Conservation Service, Iowa Department of Natural Resources, and even in the Internal Revenue Service! An entry-level position usually involves field work. Forestry careers can advance to administrative and supervisory positions. These people manage large tracts of land for sustainable timber harvest, recreation, and protection of endangered species.

State and local foresters may manage forest areas, work with private landowners to develop management plans for their forest acres, write grants, give educational presentations, or produce seedlings in a nursery.

City foresters keep the city's tree population healthy, take inventory data, and use a variety of public relations skills.

Foresters who obtain masters or doctorates may teach and do forest research at a university. The University Extension Service has foresters on staff to provide information and educational opportunities to the general public.

Foresters employed by private industry may determine harvest procedures and regeneration on tracts of land, negotiate lease contracts with private landowners, or work with government agencies to improve wildlife habitat on industry-owned land.

Foresters also can be self-employed–planting trees, growing seedlings, or consulting with landowners. The number and types of positions that utilize forestry knowledge are almost endless and a career can take many different paths. Nonprofit resource organizations or foundations may need a forester's expertise. Wildlife biology, watershed management, engineering, environmental education, park planning, environmental protection or assessment, landscape architecture, and even law can be allied with an education in forestry.

Other Materials

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Community Trees: Establishing a Community Tree Program. 1999. (available from: ISU Extension, www.extension.iastate.edu/pubs, 515/294-5247)
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Managing Iowa Habitats: Attracting Birds to Your Yard. 1998. (available from: ISU Extension, www.extension.iastate.edu/pubs, 515/294-5247)
Managing Iowa Habitats: Restoring Iowa Woodlands. 1999. (available from: ISU Extension, www.extension.iastate.edu/pubs, 515/294-5247)
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Pruning Forest Trees. 1995. (available from: ISU Forestry Extension, www.forestry.iastate.edu/ext/pubs.html, 515/294-5247)
So You Want to be in Forestry. Bethesda: Society of American Foresters.
Working with the Forest. 1985. Bethesda: Society of American Foresters.
www.americanforests.org (lesson plans, interactive activities for preK- 6th grades)
www.arborday.org (activities and games, information packets available)
www.fs.fed.us (USDA forest service)
www.safnet.org (Society of American Foresters) (elementary – high school lesson plans)
www.forestry.iastate.edu/ext/pubs.html (several publications available on woodland management and planting and growing trees)

PLT Activities (grade level)

400-Acre Wood (7-8)
A Look at Lifestyles (5-8)
Air to Drive (5-8)
Earth Manners (PreK-4)
Few of My Favorite Things, A (4-8)
Forest for the Trees (4-8)
Forest of Many Uses, A (1-8)
I'd Like to Visit a Place Where… (4-8)
Improve Your Place (5-8)
Life on the Edge (4-8)
Make Your Own Paper (1-8)
Native Way, The (4-8)
Nothing Succeeds Like Succession (3-6)
Paper Civilizations (4-8)
Peek at Packaging, A (5-8)
Plant a Tree (1-8)
Poet-Tree (3-8)
Publicize It! (5-8)
Reduce, Reuse, Recycle (see Make Your Own Paper)
Renewable Or Not? (4-8)
Resource-Go-Round (4-8)
Tepee Talk (4-8)
Three Cheers for Trees (1-6)
Trees for Many Reasons (2-8)
Trees In Trouble (1-8)
Tree Treasures (2-6)
Values on the Line (6-8)
Water Wonders (4-8)
We All Need Trees (4-6)
We Can Work It Out (5-8)
Where are the Cedars of Lebanon? (6-8)

** Supplemental information provided for italicized activities.*